Syllabus

CPSC3120 – 0002 Design Analysis of Algorithms

- **Term:** Jan 09, 2019 – May 03, 2019
- **Class Meeting Time and Place:** TR 3:30pm – 4:45pm , Lehotsky Hall, room 134
- **Instructor**:
    - Federico Iuricich
      School of Computing – CECAS
      Office 305, Mc Adams Hall
      fiurici@clemson.edu
- **Office Hours**:
    - TR 4:45pm – 6:45pm
      Or by appointment
- **TA**
    - Dane Acena
      dacena@clemson.edu

Course Description

Introduction to algorithm design and analysis. Topics include advanced data structures, amortized analysis, dynamic programming, graph algorithms, intractability and applications.

Course Overview

We live in an exciting era for computer science. The ever-increasing advances in communication and computing technologies moved computers beyond their early uses as computational engines. The use of computers is nowadays foundational to every other discipline and huge amount of data are constantly produced enlarging our possibility to understand complex phenomena. Consider, for example, how big data mining and DNA analysis have affected modern medicine, or smart search algorithms have made instantaneous availability of accurate information possible, or how cell phones, twitter, social networks have influenced political and social events.

To deal with such complexity we need algorithms and data structures that are scalable, i.e., having the ability to accommodate growing size of inputs or amounts of workloads. This course is dedicated to the analysis and understanding of scalable algorithms. Moreover, we will study the mathematical tools necessary to analyze algorithms and to define their scalability.

Learning Outcomes

After completing this course, students:

- will be able to understand the concepts and design techniques for algorithms used in diverse applications.
- will be familiar with techniques of analyzing different algorithms theoretically as well as in real life settings of diverse application domains.
- will be able to implement algorithms and data structures using a programming language and evaluate their comparative performance.
- will be able to understand how algorithms form a powerful lens through which to view problem solving in general.

Prerequisites

- CPSC 2120

Required Materials

There is no required textbook for this course but the content presented will heavily drawn from:

(1) Michael T. Goodrich and Roberto Tamassia**,"**Algorithm Design and Applications**",** Wiley;
(2) Éva Tardös and Jon Kleinberg, "Algorithm Design", Addison-Wesley**;**
(3) Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein**,** "Introduction to Algorithms". The MIT Press.

During the course you will be required to implement programs in C++. Programming assignments should be done on School Linux Machines.

Required Technical Skills

To be successful in this course, you must have a minimum working knowledge of your computer system, reasonable familiarity with C/C++ other that a knowledge of basic data structures and algorithms.

For technical assistance with the course site, students should contact ithelp@clemson.edu or visit CCIT's website.

Grading Policies

The final grade for the course will be computed as follows

- Assignments – 20%
- Mid-term exam – 30%
- Final exam – 50%

Homework will include programming assignments

Any grade challenges regarding exams, quizzes, exercises, or programs must be emailed to the instructor, with detailed justifications, within one week of the date the grades are available. No exceptions.

Late Work

Work is due at the specific deadline. Late work will not be accepted. If an assignment is only partially completed you should submit what you have by the deadline.

Topical Outline (tentative)

This is a list of topics addressed in this course:

1. Basics on Analyzing Algorithms
2. Basics on Data structures
3. Self-Balanced Binary trees
4. Greedy methods
5. Divide and conquer approaches
6. Dynamic Programming
7. Graph traversal
8. Shortest paths problems
9. Minimum Spanning tree
10. NP-completeness
11. Approximation Algorithms
12. Computational Geometry
    - Convex Hull
    - Triangulations
    - Spatial data structures

Course and University Policies

Attendance

Attendance is expected, but not required*. We may cover material in an order different from any textbook. You are responsible for any material covered in class. You are responsible for any announcements, assignments or assignment modifications that are announced in class whether you are present or not. This also applies to arriving late to class or leaving early.*

If the instructor is late for class, students are expected to wait for 15 minutes before they leave.

If classes are cancelled by the university on the day of a scheduled test we will reschedule the test.

Student Accessibility Services

Clemson University values the diversity of our student body as a strength and a critical component of our dynamic community. Students with disabilities or temporary injuries/conditions may require accommodations due to barriers in the structure of facilities, course design, technology used for curricular purposes, or other campus resources. Students who experience a barrier to full access to this class should let the professor know, and make an appointment to meet with a staff member in Student Accessibility Services as soon as possible. You can make an appointment by calling 864-656-6848, by emailing studentaccess@lists.clemson.edu, or by visiting Suite 239 in the Academic Success Center building. Appointments are strongly encouraged – drop-ins will be seen if at all possible, but there could be a significant wait due to scheduled appointments. Students who receive Academic Access Letters are strongly encouraged to request, obtain and present these to their professors as early in the semester as possible so that accommodations can be made in a timely manner. It is the student's responsibility to follow this process each semester. You can access further information at the Student Accessibility Service Website (https://www.clemson.edu/academics/studentaccess/) and the Office of Access and Equity Website (http://www.clemson.edu/campus-life/campus-services/access/).

Submission of Work from Other Courses:

You cannot turn in work that you have already turned in for credit in another course.

Copyright

Clemson students, faculty, and staff are expected to comply fully with institutional copyright policy as well as all other copyright laws.

Privacy Policy

This course is designed with your privacy in mind. If, however, you feel that an assignment or technology tool undermines your right to privacy, please contact me immediately. We will work together to determine an alternative assignment that will help you achieve the course learning outcomes.

Academic Integrity

As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form.

A simple definition of plagiarism is when someone presents another person's words, visuals, or ideas as his or her own. The instructor will deal with plagiarism on a case-by-case basis. I will use, at my discretion, the Plagiarism Resolution Form. All infractions of academic dishonesty will be reported to Undergraduate Studies for resolution through that office.

See the Undergraduate Academic Integrity Policy (https://www.clemson.edu/studentaffairs/student-handbook/academic-policies/academic-integrity.html) website for additional information about academic integrity at Clemson.

Academic Grievances

Students are advised to visit the Ombuds Office (https://www.clemson.edu/administration/ombudsman/) prior to filing a grievance. After discussion with the undergraduate academic ombudsman, students should contact Undergraduate Studies (656-3022) for assistance filing official paperwork.

Non-Discrimination

Clemson University is committed to providing a higher education environment that is free from sexual discrimination. Therefore, if you believe you or someone else that is part of the Clemson University community has been discriminated against based on sex, or if you have questions about Title IX, please contact the Title IX Coordinator, Alesia Smith, who also serves as the Executive Director of Equity Compliance, at 110 Holtzendorff Hall, 864-656-3181 (voice) or 864-656-0899 (TDD). The Title IX Coordinator is the person designated by Clemson University to oversee its Title IX compliance efforts. Please consult the University's Title IX policy (http://www.clemson.edu/campus-life/campus-services/access/title-ix/) for full details.

Student Support Services

Academic Success Center

The Academic Success Center provides free services, including tutoring, academic coaching, and academic skills workshops, for all Clemson students. Visit the Academic Success Center website (http://www.clemson.edu/asc/) more information on their services and workshops.

Writing Center

Clemson University's Writing Center offers free one-on-one tutoring for all Clemson students. Visit the Writing Center's website (https://clemson.mywconline.com) for more information about their services or to make an appointment.

Cooper Library

Reference librarians are available in person and via text, phone, email, and chat to answer your research questions. Visit Ask a Librarian (https://libraries.clemson.edu/ask/) for more information or to get in touch with a librarian.

Technical Support

If you are having hardware or software problems, CCIT's Service Desk may be able to help you. Contact them at ITHELP@clemson.edu with a detailed description of your problem.

Academic Advising

Academic advising (https://www.clemson.edu/academics/advising) is an ongoing educational process that connects the student to the University. Academic advising supports the University's mission of preparing the student for learning beyond the confines of the academy. Academic advisors represent and interpret University policies and procedures to the student and help the student navigate the academic and organizational paths of the institution.

Registrar

The Registrar's office (https://www.clemson.edu/registrar/index.html) provides information about important deadlines, degree and program requirements, and other key information, including use of iROAR to add, drop, or withdraw from courses.